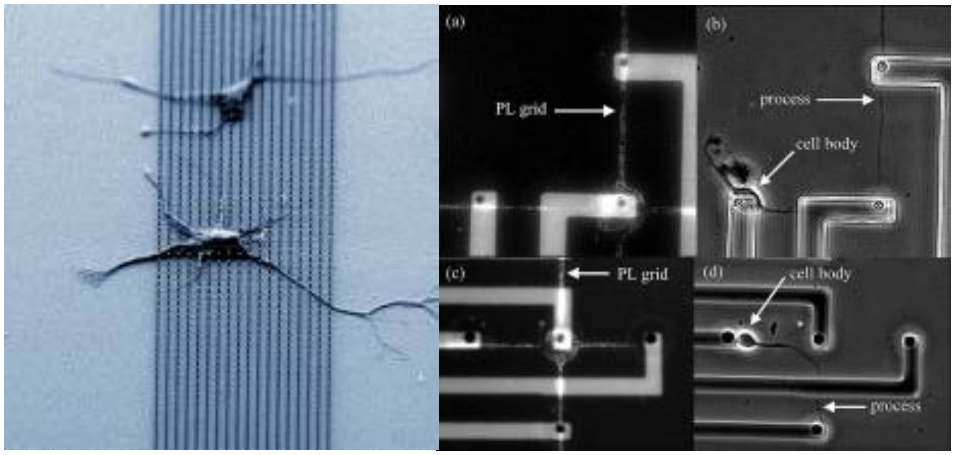
Semiconductor Electronics Division Seminar

Electrophysiological and Developmental Studies of Reconstructed Neuronal Cell Networks Using Microfabrication Techniques

Conrad James, Cornell University



Date: 11:00 AM Thursday 18 April 2002
Room: Technology Building (225), Room A362

Abstract: We are using standard microfabrication techniques to produce and study networks of primary neuronal cells from the rat hippocampus, a region of the brain implicated in learning and memory. In order to study the molecular and cellular mechanisms of memory and learning, long-term studies on cell networks of various geometrical architectures are required. Extracellular microelectrode arrays provide a non-invasive option for conducting long-term studies, and photolithographic techniques such as microcontact printing enable the production of patterned chemical cues to control the attachment and growth of cells on surfaces. Custom microfabricated electrode arrays were constructed and combined with surface chemical patterning techniques to produce cell networks on the array surface. Our work has led to the production of in vitro cell networks that can be studied over time to monitor the developmental course of electrical activity (spike production, bursting spike trains, activity-dependent spike attenuation, etc.) and synaptic connections between cells. These techniques also provide a unique strategy towards studying the dynamics of neuronal cell growth and development into mature processing elements. Time-lapse recordings and immunocytochemistry methods were used to probe the dynamics of cell growth, in particular cell-cell contacts and process branching.

Bio: Conrad James graduated from the University of Notre Dame in 1996 with a degree in electrical engineering. He is currently a PhD candidate in the Applied and Engineering Physics Department at Cornell University and is studying neuronal cell network reconstruction and investigation using microfabrication techniques under the direction of Harold Craighead.

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